

REMARKS

Applicant requests favorable reconsideration and allowance of the subject application in view of the preceding amendments and the following remarks.

To place the application in better form, Applicant submits herewith a substitute specification, which includes a new abstract. For the Examiner's convenience, also provided is a marked-up copy of the original specification showing the portions thereof which are being changed. The substitute specification includes the same changes as are indicated in the marked-up copy. Applicant's undersigned attorney has reviewed the substitute specification and submits that the substitute specification contains no new matter.

Claims 1, 3, 4, 6-8 and 10 are presented for consideration. Claims 1, 4 and 8 are independent. Claims 2, 5, 9 and 11 have been canceled without prejudice or disclaimer. Claims 1, 3, 4, 6-8 and 10 have been amended to clarify features of the present invention. Support for these changes can be found in the original application, as filed. Accordingly, no new matter has been added.

Applicant notes with appreciation that claims 2, 3, 5, 6, 9 and 10 were indicated as containing allowable subject matter and would be allowed if rewritten in independent form to include the recitations of their base and intervening claims. To expedite allowance of this application, Applicant has amended independent claims 1, 4 and 8 to substantively include the recitations of allowable dependent claims 2, 5 and 9, respectively. Applicant submits, therefore, that independent claims 1, 4 and 8, as well as claims 3, 6, 7 and 10, variously depending therefrom, should be deemed allowable at the outset.

Applicant requests favorable reconsideration and withdrawal of the objections and rejections set forth in the above-noted Office Action.

The Examiner objected to the abstract due to informalities. As discussed above, the prior abstract has been canceled and a new abstract is presented therefor. Accordingly, Applicant submits that this objection has been overcome. Such favorable indication is requested.

Claim 8 was objected to due to a typographical error. Applicant has changed "near filed" to read -- near field -- in this claim. Accordingly, this objection also has been overcome. Such favorable indication is requested.

Turning now to the art rejections, claims 1, 4, 8 and 11 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,171,730 to Kuroda et al. Claim 7 was rejected under 35 U.S.C. § 103(a) as being unpatentable over the Kuroda et al. patent in view of U.S. Patent No. 4,904,557 to Kubo. Applicant submits that the cited art, whether taken individually or in combination, does not teach or suggest many features of the present invention, as previously recited in these claims. Therefore, these rejections are respectfully traversed. Nevertheless, Applicant submits that independent claims 1, 4, and 8, for example, as presented, amplify the distinctions between the present invention and the cited art.

In one aspect of the present invention, independent claim 1 recites a near-field exposure method wherein a pressure difference is applied between a front face and a rear face of an elastically deformable exposure mask to cause deformation of the exposure mask in accordance with a substrate to be exposed and to cause the exposure mask surface to follow a surface irregularity state of the substrate so that these surfaces are closely contacted to each other, for exposure based on near field light. The method includes setting the pressure difference applied between the front and rear faces of the exposure mask at a predetermined pressure difference corresponding to a surface roughness of the substrate to be exposed, wherein the predetermined pressure difference is set at a pressure difference larger than a minimum pressure P, which is

determined to satisfy equation (1) below, in relation to a maximum surface roughness w at a measurement length \underline{a} of the substrate to be exposed:

$$P = P_m + E \frac{16hw(4h^2 + (7-\nu)w^2)}{3a^4(1-\nu)} \quad \dots (1)$$

wherein h is a thickness of a thin-film mask base material, E is Young's modulus, ν is Poisson's ratio, and P_m is a pressure difference for roughly contacting a first substrate and a second substrate with each other.

In another aspect of the present invention, independent claim 4 recites a near-field exposure apparatus for performing an exposure on the basis of near field light. The apparatus includes a device for holding a thin film mask, a pressure container capable of applying a pressure to apply a pressure difference between a front face and rear face of the thin film mask, a control device for controlling the pressure difference, a stage for holding a substrate to be exposed, and a light source. The control device is operable to set the pressure difference at a predetermined pressure difference corresponding to a surface roughness of the substrate to be exposed, and is operable to set the predetermined pressure difference at a pressure difference larger than a minimum pressure P , which is determined to satisfy equation (1) below in relation to maximum surface roughness w at a measurement length \underline{a} of the substrate to be exposed:

$$P = P_m + E \frac{16hw(4h^2 + (7-\nu)w^2)}{3a^4(1-\nu)} \quad \dots (1)$$

wherein h is a thickness of a thin-film mask base material, E is Young's modulus, ν is Poisson's ratio, and P_m is a pressure difference for roughly contacting a first substrate and a second substrate with each other.

In a further aspect of the present invention, independent claim 8 recites a near-field exposure mask to be used in an exposure process based on near field light while a pressure difference is applied between a front face and a rear face of an elastically deformable exposure mask to cause deformation in accordance with a substrate to be exposed and to cause the mask to follow a surface irregularity state of the substrate so that these surfaces are closely contacted to each other. The exposure mask includes a transparent thin-film mask base material, and a light blocking film formed therein. The thin-film mask base material has a predetermined thickness determined on the basis of surface roughness of the substrate to be exposed and a pressure difference to be applied between the front and rear faces of the mask during the exposure, and the predetermined thickness is set at a thickness smaller than a maximum film thickness determined to satisfy equations (2a) and (2b) below:

$$w(a, h, \Delta P) = \frac{4h^2}{7-\nu} \frac{1}{[R(a, h, \Delta P)]^{1/3}} + \frac{[R(a, h, \Delta P)]^{1/3}}{3} \quad \dots (2a)$$

$$R(a, h, \Delta P) = \frac{1-\nu}{7-\nu} \frac{81a^4 \Delta P}{32hE} + \sqrt{1728h^6 + \left(\frac{1-\nu}{7-\nu} \frac{81a^4 \Delta P}{32hE} \right)} \quad \dots (2b)$$

wherein h is a thickness of a thin-film mask base material, E is Young's modulus, ν is Poisson's ratio, ΔP is an applied pressure to be applied after the rough contact, and w is surface roughness at a measurement length \underline{a} .

For the reasons noted by the Examiner, Applicant submits that the cited art, whether taken individually or in combination, does not teach or suggest such features of the present invention, as recited in independent claims 1, 4 and 8. Notably, the cited art is not read to teach or suggest at least the features of the present invention, as recited in independent claims 1 and 4, of setting a pressure difference applied between front and rear faces of an exposure mask at a predetermined pressure difference, or, as recited in independent claim 8, of providing a thin-film mask base material with a predetermined thickness determined on the basis of a surface roughness of a substrate to be exposed and a pressure difference to be applied between the front and rear faces of the mask during exposure. Accordingly, the cited art should not be read to anticipate or render obvious Applicant's present invention, as recited in the independent claims.

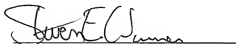
For the foregoing reasons, Applicant submits that the present invention, as recited in independent claims 1, 4 and 8, is patentably defined over the cited art, whether that art is taken individually or in combination.

Dependent claims 3, 6, 7 and 10 also should be deemed allowable, in their own right, for defining other patentable features of the present invention in addition to those recited in their respective independent claims. Further individual consideration of these dependent claims is requested.

Applicant submits that the instant application is in condition for allowance. Applicant requests favorable reconsideration, withdrawal of the objections and rejections set forth in the above-noted Office Action and an early Notice of Allowance.

Applicant's undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should be directed to our address listed below.

Respectfully submitted,

A handwritten signature in dark ink, appearing to read "Steven E. Warner", is written over a horizontal line.

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